

Application Serial No. 10/578,149
Docket No. 7862-88107

REMARKS

The Office Action of October 30, 2009, and the references cited therein have been carefully considered.

In this Amendment, claim 1 has been cancelled and replaced by a new independent claim 17 which does not define the invention with product-by-process limitations, but rather by structural limitations, claims 2-5 have been amended to correct noted informalities and so that they properly depend from claim 17, and claim 6 has additionally been cancelled. Moreover, new claims 18 and 19, dependent on claim 17, has been added, with claim 18 reciting that the bottom part of the separator is outwardly curved and claim 19 reciting an additional novel feature of the invention. New claims 17-19 are all readable on the elected invention.

The rejection of claims 1, 2, 4 and 6 under 35 U.S.C 102(b) as being anticipated by, or alternatively under 35 U.S.C 103(a) as obvious over Haruhisa et al. JP Patent Publication 07245091) has been noted. In view of the replacement of claim 1 by claim 17, and the cancellation of claim 6, reconsideration of the above mentioned rejections of claims 17, 2 and 4 over the Haruhisa et al reference is respectfully requested.

The present invention as defined in independent claim 17 is directed to an improved cylindrical separator for a cylindrical battery cell. According to claim 17, cylindrical separator for cylindrical cells according to the invention is of the type comprising a cylindrical body constituted by a layered structure of a plurality of turns of at least a non-woven sheet material, and a bottom part closing a first end of the cylindrical body, and with the bottom part being formed by a bent over or pressed extension of the wound layers of the cylindrical body and fused by heat. Such a structural arrangement is also shown by the Haruhisa et al. reference. However, claim 17 further recites that the bottom part of the cylindrical body also has a slightly curved shape with respective wrinkle-free, continuous inner and outer surfaces and a substantially uniform thickness. These latter characteristics of the separator according to the invention, which incidentally directly result from the method according to the

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invention, are not taught or made obvious by the disclosure of the Haruhisa et al. reference.

Support for the added new limitations of claim 17 can clearly be seen in Figures 13 and 14 and is found in the description of the method, particularly, the portion of the specification found on page 7, line 30 to page 8, line 26. For example, the curved shape of the separator bottom corresponds to the shape of the head (28) of the pin or mandrel (23) and the groove (30) as described on page 8, lines 7-13. Moreover, there will be no wrinkles, for example, as stated on page 8, lines 9-11, and 24-26. Additionally, it is obvious to one skilled in the art that heat fusion of a wet paper under pressure between two conforming surfaces will result in a continuous smooth surface with an even thickness, wherein the thickness corresponds to the gap between the two parts of the die. It is also clear that both surfaces of the paper are abutting to respective conforming surfaces of the tool (head 28 and recess 33), and the heat fusion result in smooth wrinkle free surfaces on both sides of the bottom part of the separator. As a result of the specific shape of the bottom part of the separator, i.e., the curved wrinkle free bottom with uniform thickness, provides the advantages described in the application, e.g., page 10, second paragraph, concerning cell performance, and the advantages of easy insertion into the cell, as well as the improved insulation between the inner and outer spaces of the separator.

The Haruhisa et al. reference, as indicated above, does teach a separator with a wound cylindrical body and a bottom formed by an extension of the cylindrical body which is fused by heat as defined in claim 17. However, as is clear from the description of the invention in this reference and the drawings, the bottom part is not curved, but rather is clearly flat. Moreover, there is no discussion in this reference of the thickness of the bottom or that both surfaces thereof being without wrinkles, all as required by claim 17. This reference seeks to reduce the quantity of paper at the bottom so as to reduce the failure rate due to incomplete heat bonding and breakage of the separator bottom due to friction between the separator and the cathode rings, and does this by removing part of the with wound paper at one edge prior to bottom formation as shown

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in Fig. 3. Such would not appear to result in a uniform thickness wrinkle free bottom as required by independent claim 17. Accordingly, for the above stated reasons, it is submitted that claim 17 is allowable over the Haruhisa et al reference under 35 U.S.C. 102 and 103. It is noted that the a claim corresponding to claim 17 was allowed in both the counterpart European and Chinese patent applications over the Haruhisa et al reference.

Claims 2 and 4 are each dependent on claim 17, and are initially submitted to be allowable over the Haruhisa et al reference for at least the same reasons as that claim. These claims recite that regardless of whether the separator is a wound body formed of a plurality of wound separate sheets of material (claim 2), which may be of different materials, e.g., a laminate, or formed of multiple windings of a single sheet of material (claim 4), there is no binder connecting the windings of the plurality of sheets or of the windings of the single sheet. This has the advantage, as stated, for example, on page 10, lines 6 and 7, that after insertion of the separator into the cell "...the separator's winding can stretch out a bit to fill the whole inner space defined by the hollow inner surface of the cathode rings 37." As a result, the entire cathode ring inner space can be utilized and avoid the small gap, with its problems, resulting from having to use a slightly undersized separator to facilitate insertion of the separator into the cell as in the prior art. Paragraph 8 of the Haruhisa et al reference, which was referenced in rejecting these claims, clearly states that a binder like polyvinyl chloride is utilized. Moreover, claim 1 of the reference clearly states that the separator material contains a binder. Accordingly, for the above stated additional reasons, it is submitted that claims 2 and 4 are allowable over the Haruhisa et al reference.

The rejection of claim 3 as unpatentable over the Haruhisa et al. in view of Devitt et al has been noted and reconsideration is requested. In this ground of rejection, the Dewitt et al patent is cited simply to show that it is known to form a separator have one wound layer of a semi-permeable membrane and cellophane. This patent, however, does not overcome the deficiencies of the Haruhisa et al reference as discussed above with regard to claims 17 and 2, from which claim 3 depends. Accordingly, it is submitted

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that claim 3 is allowable over the cited combination of references for at least the same reasons as claims 17 and 2.

The rejection of claim 5 as unpatentable over the Haruhisa et al. in view of Daniel-Ivad et al and Tomantschger et al. has likewise been noted and reconsideration likewise is requested. In this ground of rejection, the Daniel-Ivad et al and Tomantschger et al. patents are cited simply to show that it is known to include a thermoplastic sealant at the central zone on the outside of the bottom part of a separator to prevent electrical contact between the negative electrode and the cell container. These patents, however, does not overcome the deficiencies of the Haruhisa et al reference as discussed above with regard to claims 17, from which claim 5 depends. Accordingly, it is submitted that claim 5 is allowable over the cited combination of references for at least the same reasons as claim 17.

Newly presented claim 18 depends from claim 17 and recites that the curved bottom part is outwardly curved, i.e., convex when the separator bottom is viewed from the outside. Accordingly, this claim is submitted to be allowable for at least the same reasons as claim 17.

Newly presented claim 19 depends from claim 17 and recites that the bottom part according to the invention sufficiently electrically seals or insulates the separator relative to the surrounding cylindrical cell so that no need for any additional disc-shaped insulating element close to the inner surface of said bottom part to provide the sealing. That is, the separator according to the invention, as shown for example in Fig. 17, provides sufficient sealing between the interior and exterior of the separator so that no additional insulating structure, e.g., a dish shaped element or disk in the bottom of the separator is required. As a result, the entire volume of the separator can be utilized. This is not the case according to the Haruhisa et al reference wherein a bottom paper (64) as shown in Fig. 5 is disposed at the bottom of the separator in order to complete the sealing. Accordingly, for this reason, in addition to those discussed above with

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regard to claim 17 from which claim 19 depends, it is submitted that claim 19 is allowable over the Haruhisa et al reference.

In the above-identified Office Action, the Examiner has simply required that Applicant elect for further prosecution on the merits either Invention I, as defined in claims 1-6, drawn to a cylindrical separator for cylindrical cells, or Invention II, as defined in claims 7-16, drawn to a method for making a cylindrical separator closed at the bottom for batteries with a hollow cylindrical interior.

In requiring this election, the Examiner has taken the position that Invention I and Invention II are not so linked as to form a single general inventive concept under PCT Rule 13.1. First of all, it should be pointed out that the international searching authority has already determined that there is unity of invention between Inventions I and II. In this regard note the international preliminary examination report (IPER) wherein all sixteen of the claims were examined. Note further that PCT Rule 13.2 does **not** require that the limitations of both inventions be coextensive as apparently urged by the Examiner but only that there be a single inventive concept, which is the case here. Finally, claim 7 has been amended so that it is now claimed as a method of making the separator of claim 1, and thus is a method of making the specific cylindrical separator defined in claim 1.

Accordingly, for the above stated reasons, it is submitted that there is unity of invention between inventions I and II as required by PCT Rule 13.1. Therefore, a withdrawal of the restriction requirement and an action on the merits of claims 1-16 is respectfully requested.

If the Examiner is of the opinion that the prosecution of the present application would be advance by a personal interview, the Examiner is invited to telephone undersigned counsel to arrange foe such an interview.

To the extent necessary during prosecution, Applicant hereby requests any required extension of time not otherwise requested and hereby authorizes the Commissioner to charge

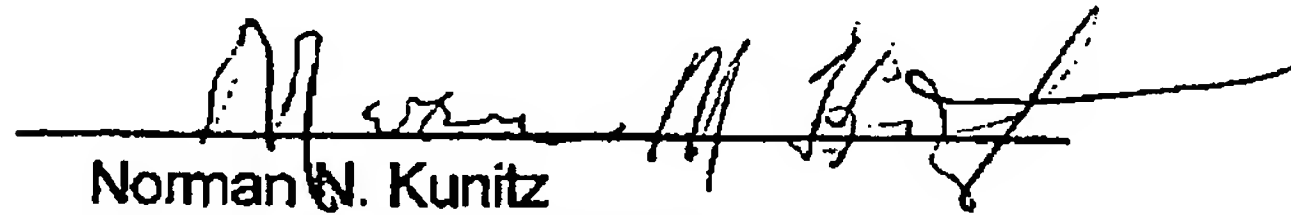
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any required fees not intentionally omitted, including application processing, extension, extra claims, statutory disclaimer, issue, and publication fees, to Deposit Account 06-1135.

Respectfully submitted,

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